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Kevin Cink

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EXAMINER

NEGRELLI, KARA B

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/593,111  
Filing Date: September 14, 2006  
Appellant(s): CINK ET AL.

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Gary C. Cohn  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed March 12, 2010 appealing from the Office action mailed October 13, 2009.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The following is a list of claims that are rejected and pending in the application:

Rejected claims that are subject of this appeal: 24, 27-32.

Cancelled claims: 1-23

Claims withdrawn from consideration: 25, 26

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

There were no amendments after the final rejection.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

US 5,134,171	Hammel et al.	07-1992
JP 2003-073495	Shinohara et al.	03-2003
US 5,238,968	Morita et al.	08-1993
US 6,395,791	Chaudhary	05-2002

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 24, 27-30, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammel et al. (US 5,134,171) in view of Shinohara (JP 2003-073495). The rejection is over JP 2003-073495, however, for convenience the machine translated English equivalent will be cited below and is attached.

Hammel et al. teach polyhydroxy acid foam materials comprising polylactic acid and carbon dioxide (column 2, lines 34-38 and column 2, line 60 - column 3, line 11). The polymer composition of the polyhydroxy acid foam having from 50-97%, and preferably from 85 to 96% of the L enantiomer of lactic acid, with additional lactic acid units being of the D enantiomeric configuration (column 4, lines 31-39). The polyhydroxy foam is produced using an extrusion system (Example 1, column 6, lines 35-61). Furthermore, the formed foam is subjected to heat treatment after the extrusion process (Example 1, column 6, lines 56-57). Hammel et al. further teach that at least 90% of the foam cells are closed cells before shaping (column 3, lines 43-45) or above 50% of the cells are closed after shaping. Hammel et al. further teach that the lactic acid-containing polymer may comprise long chain branching (column 2, lines 45 - column 3, line 5).

With regard to the amount of closed cells, it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir. 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

Hammel et al. teach that the same amounts of L and D enantiomers of polylactic acid are present in the resin to be foamed as are taught in the instant specification. The polymer of Hammel et al. composition of the polyhydroxy acid foam having from 50-97%, and preferably from 85 to 96% of the L enantiomer of lactic acid, with additional

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lactic acid units being of the D enantiomeric configuration (column 4, lines 31-39). The polyhydroxy foam may comprise a carbon dioxide foaming agent and is produced using an extrusion system (Example 1, column 6, lines 35-61). Furthermore, the formed foam is subjected to heat treatment after the extrusion process. See example 1, column 6, lines 57-58).

In one example of Hammel et al., 25 lbs/hr of blowing agent is incorporated into 500 lbs/hour of molten polylactic acid (85% L, the remaining 15% being D/L). This corresponds to 5 wt% blowing agent. Because the blowing agents to be used may comprise carbon dioxide, and because an example teaches using 5 wt % blowing agent, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate 5 wt% carbon dioxide blowing agent into the molten polylactic acid polymer of Hammel et al. The molten polymer is further heat treated after being formed (column 6, lines 57-58). Because the composition may comprise the same amounts of L and D configurations of polylactic acid, and may comprise 5 wt% carbon dioxide, and because the composition is exposed to heat after being formed, as taught in the instant application, one of ordinary skill in the art would reasonably expect the composition to have the same crystallinity as taught in the instant application. Case law holds that a material and its properties are inseparable. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Hammel et al. do not expressly teach that the foam comprises from 5 to 15% or more specifically from 7 to 11% carbon dioxide or that the foam has a crystallinity of 13-24 J/g as measured by differential scanning calorimetry.

However, Shinohara teaches an amorphous polylactide foam comprising from 2 to 20 wt% carbon dioxide foaming agent (paragraph [0002]), said foam of which may have a crystallinity, as measured by differential scanning calorimetry, of 15 or more J/g (paragraph [0011]).

It would have been obvious to use the amount of carbon dioxide taught by Shinohara et al. in the invention of Hammel et al. in order to improve the “die shape reproducibility” and weld nature of the polylactic acid resin (Shinohara et al., paragraph [0004]).

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammel et al. (US 5,134,171) and Shinohara (JP 2003-073495) and further in view of Morita et al. (US 5,238,968).

Hammel et al. and Shinohara teach the compositions as applied to claims 24 and 27-30 but do not expressly teach that the extrusion temperature is from 70° to 140°C.

However, Morita et al. teach a process foamed material comprising a composition polylactic acid which is composed of 85 to 100% by mole of L-lactic acid unit and from 0 to 15% by mole of the antipode unit of each lactic acid (column 3, 1-5), from 0.2 to 10 parts by weight (based on 100 parts by weight polylactic acid-based resin) of a blowing agent which may be carbon dioxide (column 6, lines 23-35), process of which further comprises extruding the composition at a temperature of from 100°C to 270°C (column 6, lines 50-54) which overlaps the instantly claimed extrusion temperature of instant claim 31. It is well settled that where the prior art describes the

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components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir. 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to use the extrusion temperatures taught in Morita et al. in the processes of Hammel et al. and Morita et al. because extrusion temperature lower than 100°C makes extrusion unstable and tends to cause overload while temperatures over 270°C are unfavorable because decomposition of the lactic acid based polymer becomes violent (Morita et al., column 6, lines 55-59). All references teach foamable compositions which may comprise the required amounts (as taught in the instant specification) of L and D enantiomers of lactic acid, a carbon dioxide blowing agent, and extrusion and therefore are analogous art.

#### **(10) Response to Argument**

Appellant's arguments with regards to claims 24 and 27-32 filed March 12, 2010 have been fully considered but they are not persuasive.

Appellant argues that two manufacturing methods for making polymer foams are the extrusion method and the bead foam method. Appellant asserts that in the former method, a polymer is melted and combined with a blowing agent in an extruder, the



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extruder is pressurized to prevent the blowing agent from escaping, and the pressurized blowing agent mixture is then expelled to a die region of reduced (usually atmospheric) pressure. Appellant further states that the product of an extrusion process is *in most cases* a single mass of cellular polymer with a uniform cross-section due to the expansion process, said mass of which may be shaped into specialized parts or high volume parts.

Appellant further argues that the bead foam process is dramatically different in that in the bead foam process, the beads are impregnated with a blowing agent, taking care not to melt or soften them (lest they lose their particulate form). Appellant states that moldings are made from these beads by pouring them into a mold and then heating them, without applied pressure, enough to expand the blowing agent. Appellant further argues that the beads are softened enough that they can be expanded with the blowing agent so they stick together, and the products of this bead-foam process are easily recognized because the bead structures is *usually* still visible in the molded product. Appellant also states that the bead foam process is often used to make small molded articles or articles with complex shapes that cannot be made easily by extrusion or by fabricating extruded foam.

As discussed in the previous office action mailed on October 20, 2009, the bead foam process is not exclusively limited to the process described by the appellant in which beads are impregnated with a blowing agent, taking care not to melt or soften them (lest they lose their particulate form) and formed into moldings by pouring them into a mold and then heating them, without applied pressure, enough to expand the

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blowing agent. In fact, Chaudhary US 6, 395,791, teaches that in a process for forming foam beads suitable for molding into articles, blends of molten polymer are combined with blowing agent and in a convention foam extrusion apparatus. The foam strand may be then granulated or pelletized to form bead shaped foam particles. The beads may then be used for form almost any variety of molded material, such as cushion packaging, computers, televisions, bench top covers, automotive materials, building insulation, gaskets, medical devices, thermal insulation in buildings and construction, separators, sound attenuation, as well as several other applications. The products of foam beads are not limited to small molded articles or articles with complex shapes.

In addition, Chaudhary demonstrates that extrusion molding and the bead foam process are not mutually exclusive processes which cannot be used together. In Chaudhary, a molten polymer undergoes both extrusion and bead foam processes.

Appellant states that because carbon dioxide has a lower molecular weight than most other blowing agent candidates, only small amounts are needed to expand the foam. Appellant states that in the Hammel reference, carbon dioxide is only used in an amount of 0.44% by weight. Appellant states that in the process of the instant invention, two requirements include foaming a polylactide that contains 80% by weight polylactide units and from 5 to 15% of carbon dioxide blowing agent added to the molten polymer mixture (which incorporates the polylactide).

Appellant argues that Hammel et al. teach, in Example 8 of the invention, an extrusion foaming process which comprises using poly(lactic acid) as the resin and only

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0.44% by weight carbon dioxide, and Example 8 is the only example which employs the requisite blowing agent.

The examiner notes that the carbon dioxide blowing agent of the instant application is to be present in an amount of *about* 5% to 15% by weight. In addition, nowhere in the disclosure of Hammel et al. is it disclosed that only 0.44% by weight (or even 2.26 lbs carbon dioxide to 495.34 lbs per resin) carbon dioxide must be employed. In fact, Example 1 teaches that 25 lbs of blowing agent in 472.5 lbs of polylactide resin may be used to produce the polylactide foam. Examples of the blowing agent disclosed in Hammel include carbon dioxide, nitrogen, or various HFCs (hydrofluorocarbons). Therefore, because Hammel does not contain a teaching limiting the carbon dioxide blowing agent to the amount disclosed in example 8, and because Hammel does disclose an example in which 25lbs of blowing are using in 472.5 lbs of resin (about 5%), it would have been obvious to one of ordinary skill in the art to use about 5% by weight of carbon dioxide (or any of the disclosed blowing agents) in the disclosed polylactide foam.

While Hammel et al. does not exemplify about 5% carbon dioxide blowing agent in Example 8, this does not negate a finding of obviousness under 35 USC 103 since a preferred embodiment such as an example is not controlling. Rather, all disclosures "including unpreferred embodiments" must be considered. In re Lamberti 192 USPQ 278, 280 (CCPA 1976) citing In re Mills 176 USPQ 196 (CCPA 1972). Therefore, it would have been obvious to one of ordinary skill in the art to utilize a blowing agent in

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an amount of about 5% by weight, said blowing agent of which may comprise carbon dioxide, given that Hammel teaches each one.

Furthermore, Shinohara teaches a polylactide foam comprising from 2 to 20 wt% carbon dioxide foaming agent (paragraph [0002]), said foam of which may have a crystallinity, as measured by differential scanning calorimetry, of 15 or more J/g (paragraph [0011]). Appellant argues that because Shinohara teaches a bead foam process the teachings of Shinohara do not relate to any extrusion process and are therefore not relevant to the instant invention or the teachings of Hammel.

Appellant's argument is not persuasive. All of Shinohara et al., Hammel et al., and the instantly claimed invention disclose polylactic acid foam materials comprising carbon dioxide blowing agent, said foam materials of which are produced using extrusion. Shinohara et al. is used as a **teaching** reference. Note that while Shinohara may not disclose all the features of the present claimed invention, Shinohara is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nieveelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, from 2 to 20% by weight carbon dioxide used to foam a polylactic acid foam material, and in combination with the primary reference, discloses the presently claimed invention.

In addition, in response to applicant's arguments against Shinohara et al. individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642

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F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Furthermore, as evidenced above using the teachings of Chaudhary, extrusion processes and bead foam processes are not mutually exclusive. Contrary to the appellants' assertion that Chaudhary teaches only making the foam beads and not expanding them, appellants argument is not persuasive. Again, Chaudhary is used as evidence to show that that in a process for forming foam beads suitable for molding into articles, blends of molten polymer are combined with blowing agent and in a convention foam extrusion apparatus. The foam strand may be then granulated or pelletized to form bead shaped foam particles. The foam beads are not produced by extruding molten material, forming into beads, and then impregnating beads with blowing agent, as the appellant describes on page 3, second full paragraph of the Appeal Brief filed March 12, 2010. Chaudhary is used to show that bead foam processing is not limited to the process described by the appellant. In addition, the beads may then be used for form almost any variety of molded material, such as cushion packaging, computers, televisions, bench top covers, automotive materials, building insulation, gaskets, medical devices, thermal insulation in buildings and construction, separators, sound attenuation, as well as several other applications. The products of foam beads are not limited to small molded articles or articles with complex shapes.

Appellant argues that "weld nature" and "die shape reproducibility" are exclusively applicable to bead foam processes and not the extrusion foaming process. As discussed in the previous office action, both "weld nature" and "die shape

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reproducibility" are not characteristics of only foam **beads** and does not only refer to how well particles stick together in a bead foam process. Rather, "weld nature" is also applicable to foam strands, sheets, boards, or other extruded foam shapes. Die shape reproducibility is not contingent upon foam materials being only of a bead shape. In fact, "die shape" is particularly applicable to extrusion. No evidence has been provided to support the applicant's position. The fact that the process of Shinohara is used to form foam beads does not support the appellant's position that "weld nature" and "die shape reproducibility" are exclusively applicable to bead foam processes. The terms "weld nature" and "die shape reproducibility" have not been "seized upon" by the examiner "to conclude that that Shinohara must be describing an extrusion foaming process." Rather, these terms are used to provide motivation as to why one of ordinary skill in the art would modify the foam of Hammel by including the amount of blowing agent disclosed in Shinohara. "Weld nature" and "die shape reproducibility", as well as the crystallinity of the foams of Shinohara (*and* the added benefit of surface smoothness, see paragraph [0035] of Shinohara) are important characteristics for foam materials comprising polylactic acid resins containing both the L and D enantiomers.

Appellant argues that Morita does not attempt to make any specific teachings about how much of any specific type of blowing agent should be used. Appellant asserts that the only such specific teachings are in Mortia's Table 3, where azodicarboxylic acid amine, a solid reactive type of blowing agent, is used in amounts ranging from 0.1 to 15%.

As admitted by the Appellant in the last sentence of the second full paragraph of the Appeal Brief filed March 12, 2010, Morita is relied upon for its teachings regarding extruding temperature, which are described at column 6, lines 53-55 at being from 100 to 270°C. First, it is noted that Morita et al. teaches a process foamed material comprising a composition polylactic acid which is composed of 85 to 100% by mole of L-lactic acid unit and from 0 to 15% by mole of the antipode unit of each lactic acid (column 3, 1-5), from 0.2 to 10 parts by weight (based on 100 parts by weight polylactic acid-based resin) of a blowing agent which may be carbon dioxide (column 6, lines 23-35). Secondly, it is again noted the Morita et al. is used as a **teaching** reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, an extrusion temperature for a foaming process for producing polylactide foam, and in combination with the primary reference, discloses the presently claimed invention. Furthermore, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In addition, while Morita et al. may not disclose examples teaching the inclusion of 0.2 to 10 parts by weight (based on 100 parts by weight polylactic acid-based resin) of a carbon dioxide blowing agent, this does not negate a finding of obviousness under 35 USC 103 since a preferred embodiment such as an example is not controlling. Rather, all disclosures "including unpreferred

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embodiments" must be considered. *In re Lamberti* 192 USPQ 278, 280 (CCPA 1976) citing *In re Mills* 176 USPQ 196 (CCPA 1972). Therefore, it would have been obvious to one of ordinary skill in the art to utilize an from 0.2 to 10 parts by weight of a blowing agent (based on 100 parts by weight polylactide resin), said blowing agent of which may comprise carbon dioxide, given that Morita et al. teaches each one.

As to the arguments with regards to claims 27 and 32, the arguments described above are included herein for the sake of brevity. In summary, Example 8 of Hammel is but ONE example of the invention, and the example does not negate a finding of obviousness under 35 USC 103 since a preferred embodiment such as an example is not controlling. Rather, all disclosures "including unpreferred embodiments" must be considered. *In re Lamberti* 192 USPQ 278, 280 (CCPA 1976) citing *In re Mills* 176 USPQ 196 (CCPA 1972). Therefore, it would have been obvious to one of ordinary skill in the art to utilize a blowing agent in an amount about 5% by weight, said blowing agent of which may comprise carbon dioxide, given that Hammel teaches the use of 25 lbs of blowing agent in 472.5 lbs of polylactide resin and further teaches that the blowing agent may be carbon dioxide.

As to the extrapolations and assumptions regarding molar quantity, the claims do not recite molar quantity. Hammel contains no teaching regarding molar quantity. The claims teach weight percent of blowing agent which may be about 5% to 15% of carbon dioxide in polylactide resin. There is no suggestion whatsoever as to how molar quantity of blowing agent is relevant to the instant application or the prior art which obviates the instant application. Again, it is noted that Hammel teaches the use of 25 lbs of blowing



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agent in 472.5 lbs of polylactide resin and further teaches that the blowing agent may be carbon dioxide. Nowhere in Hammel is it disclosed that carbon dioxide is limited to only the amount of Example 8 of the invention. Hammel does not expressly disclose the amount of blowing agent to be included. One of ordinary skill would therefore look to the examples to find what amounts may be used. The upper limit of all the examples is the amount disclosed in Example 1, 25lbs of blowing agent in 472.5 lbs of polylactide resin. This corresponds to about 5% by weight blowing agent.

In addition, Shinohara is relied upon for the disclosed amount of blowing agent and crystallinity as instantly claimed. Appellant again asserts that because Shinohara describes a bead foam process no extrusion foaming process is disclosed. It is again noted that Shinohara is a **teaching** reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nieveit*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, the use of 2 to 20% by weight carbon dioxide used to produce polylactide foam, and in combination with the primary reference, discloses the presently claimed invention. Furthermore, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). used as a teaching reference.

As to the assertion that Hammel and Shinohara are non-analogous art, it is again noted that all of Shinohara et al., Hammel et al., and the instantly claimed invention

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disclose polylactic acid foam materials comprising carbon dioxide blowing agent, said foam materials of which are produced using extrusion. The prior art references and the instant application are therefore all from the same field of endeavor and are certainly not non-analogous art. JP 2002-322309 A teaches away from the instantly claimed invention and is therefore not closer to the instantly claimed invention than either Hammel or Shinohara.

Appellant further argues that the foams of Hammel are amorphous. Appellant argues that crystallinity is not an inherent property of polylactide resins, foamed or unfoamed. Appellant argues that crystallinity of any particular polylactide article depends on many factors including certain attributes of the resin itself and the presence of other materials. Appellant argues the significance of heat treatment of the material after foaming and forming.

Appellant's argument is not persuasive. Page 3, lines 18-27 of the instant specification explicitly teaches that the ratio of the lactic acid enantiomers L and D and the many in which they are copolymerized greatly affect the crystalline behavior of the polymer. Page 3 further teaches that polymers that are very high in one enantiomer tend to be semi-crystalline. The instant specification explicitly teaches that copolymers containing from 75-98% of one lactic acid enantiomer and 2 to 25% of the other lactic acid enantiomer are particularly suitable for the instant invention.

The polylactic acid resins of Hammel may have as high as 97% of the L-enantiomer PLA and as little as 3% of the D enantiomer PLA. Polymers of this type tend to be semi-crystalline. The examples of the polylactic acid polymers of Hammel may

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have 85% of the L-enantiomer, and 15% of the D-enantiomer. This ratio of L and D enantiomers falls within the instantly disclosed amounts of enantiomers. Because the instant specification teaches that crystallinity is greatly influenced by the ratio of lactic acid enantiomers of the polymer, and because the polylactic acid polymers of Hammel may have the same ratio of L and D enantiomers as disclosed in the instant application; and because the foams of Hammel and the instant application comprise a blowing agent such as carbon dioxide which are melt processed with the polymer material via extrusion, and because both Hammel and the instant application teach that the formed foams are exposed to a heat treatment step after being formed (see column 6, lines 56-57 of Hammel), the polymers (as well as the foams produced from the polymers) of Hammel would inherently have the same crystallinity as disclosed in the instantly claimed invention.

The appellant has provided no evidence that the foams of Hammel do not have the same crystallinity as the instantly claimed foams. Appellant argues that the foams of Hammel are exposed to elevated temperatures for "very short times" (see page 11, lines 3-5). Appellant has not cited the time periods to which they refer, and after further review, the Examiner has been unable to find the short periods of time to which the Appellant refers. The foam materials of Hammel are exposed to elevated temperatures for short periods of time, and it is noted that the features upon which applicant relies (i.e., exposure time to high temperatures) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the

specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Appellant argues that the portions of Shinohara et al. relied upon to teach crystallinity of a polylactide foam apply to the resin itself and not the foam material. Appellant's argument is not persuasive. Shinohara et al. teaches a polylactide material with the requisite crystallinity being foamed with the requisite amount of carbon dioxide foam. The material is foamed at room temperature (paragraph [0004] of Shinohara). Therefore, the crystallinity of the polymer material will not change upon formation of the material into a foam. As admitted by applicant, further crystallization of the foam material occurs upon long periods of exposure to high temperatures.

Appellant argues that the claims 28 and 29 require a post-extrusion heat treatment step to induce crystallinity to the foam and that Hammel does not teach or describe such a step. However, as noted above, Hammel teaches heating the foam material after melt extrusion. In addition, Shinohara et al. teach a polylactide foam material with a crystallinity of great than 15 J/g (paragraph [0004]).

Appellant argues that instant claim 30 requires from 7 to 11% of carbon dioxide. Appellant argues that Hammel does not described using more than 5% of any blowing agent and clearly does not described using 7 to 11% of carbon dioxide. Appellant argues that Shinohara does not relate to extrusion foaming processes at all.

Appellants' argument is not persuasive. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.

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See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is again noted that Shinohara is a **teaching** reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nieveit*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, the use of 2 to 20% by weight carbon dioxide used to produce polylactide foam, and in combination with the primary reference, discloses the presently claimed invention. It would have been obvious to use the amount of carbon dioxide taught by Shinohara et al. in the invention of Hammel et al. in order to improve the “die shape reproducibility” and weld nature of the polylactic acid resin (Shinohara et al., paragraph [0004]).

Appellant argues that because Hammel does not describe any carbon dioxide loadings in excess of 0.44 wt%, and because Shinohara relates to a different type of foaming process and is not relevant to an extrusion foaming process, and because Morita does not overcome the shortcomings of the other references, claim 31 is not rendered obvious by the combination of these references. Appellant argues that Morita describes blowing agent amounts as much as 10% based on resin weight and that the blowing agent takes into account reactive solid, liquid, and gaseous types. Appellant argues that there is nothing to lead one to select any specific quantity of carbon dioxide to use.

Appellant's argument is not persuasive. Hammel teaches polyhydroxy acid foam materials comprising polylactic acid and carbon dioxide (column 2, lines 34-38 and

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column 2, line 60 - column 3, line 11). The polymer composition of the polyhydroxy acid foam having from 50-97%, and preferably from 85 to 96% of the L enantiomer of lactic acid, with additional lactic acid units being of the D enantiomeric configuration (column 4, lines 31-39). The polyhydroxy foam is produced using an extrusion system (Example 1, column 6, lines 35-61). Furthermore, the formed foam is subjected to heat treatment after the extrusion process (Example 1, column 6, lines 56-57). Hammel et al. further teach that at least 90% of the foam cells are closed cells before shaping (column 3, lines 43-45) or above 50% of the cells are closed after shaping. Hammel et al. further teach that the lactic acid-containing polymer may comprise long chain branching (column 2, lines 45 - column 3, line 5). In one example of Hammel et al., 25 lbs/hr of blowing agent is incorporated into 500 lbs/hour of molten polylactic acid (85% L, the remaining 15% being D/L). This corresponds to 5 wt% blowing agent. Because the blowing agents to be used may comprise carbon dioxide, and because an example teaches using 5 wt % blowing agent, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate 5 wt% carbon dioxide blowing agent into the molten polylactic acid polymer of Hammel et al. Example 8 of Hammel does not negate a finding of obviousness under 35 USC 103 since a preferred embodiment such as an example is not controlling. Rather, all disclosures "including unpreferred embodiments" must be considered. *In re Lamberti* 192 USPQ 278, 280 (CCPA 1976) citing *In re Mills* 176 USPQ 196 (CCPA 1972). Therefore, it would have been obvious to one of ordinary skill in the art to utilize an about 5% of a blowing agent, said blowing agent of which may comprise carbon dioxide, given that Hammel teaches

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each one. No where in the disclosure of Hammel et al. is it disclosed that only 0.44% by weight (or even 2.26 lbs carbon dioxide to 495.34 lbs per resin) carbon dioxide must be employed.

With regards to Shinohara, it is again noted that the bead foam process is not exclusively limited to the process described by the appellant in which beads are impregnated with a blowing agent, taking care not to melt or soften them (lest they lose their particulate form) and formed into moldings by pouring them into a mold and then heating them, without applied pressure, enough to expand the blowing agent. This is evidenced by Chaudhary (US 6,395,791).

All of Shinohara et al., Hammel et al., and the instantly claimed invention disclose polylactic acid foam materials comprising carbon dioxide blowing agent, said foam materials of which are produced using extrusion. Shinohara et al. is used as a **teaching** reference. Note that while Shinohara may not disclose all the features of the present claimed invention, Shinohara is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, from 2 to 20% by weight carbon dioxide used to foam a polylactic acid foam material, and in combination with the primary reference, discloses the presently claimed invention.

The same is true of Morita. Morita is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently

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claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, an extrusion temperature of from 100°C to 270°C used to produce a polylactide foam, and in combination with the primary reference, discloses the presently claimed invention. It would have been obvious for one of ordinary skill in the art at the time the invention was made to use the extrusion temperatures taught in Morita et al. in the processes of Hammel et al. and Morita et al. because extrusion temperature lower than 100°C makes extrusion unstable and tends to cause overload while temperatures over 270°C are unfavorable because decomposition of the lactic acid based polymer becomes violent (Morita et al., column 6, lines 55-59). All references teach foamable compositions which may comprise the required amounts (as taught in the instant specification) of L and D enantiomers of lactic acid, a carbon dioxide blowing agent, and extrusion and therefore are analogous art.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/KARA NEGRELLI/

Examiner, Art Unit 1796



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